

Rudra Murthy

Ph.D. Scholar at IIT Bombay

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Profile

PhD Scholar at Center For Indian Language Technology (CFILT), Indian Institute of Technology Bombay, on a topic “Multilingual Learning using Deep Learning for various Natural Language Processing tasks” under the guidance of Prof. Pushpak Bhattacharyya.

Research Interests

I am broadly interested in the application of Deep Learning to various Natural Language Processing (NLP) tasks. Recently, I have garnered interest in *Aided NLP for Low-Resource Languages*. Low-resource languages do not have sufficient data, tools, and other resources (also known as data sparsity) to successfully existing train machine learning models for any NLP task. My current focus is on borrowing features (implicitly statistics) from one or more related languages (multilingual learning). This should minimise the impact of data sparsity and lead to improvements in the low-resource language for the task in hand. I am specifically exploring ways of minimizing the divergence between unrelated languages at various granularities to better existing multilingual learning approaches.

Areas of Expertise

NLP: Multilingual Learning, Transfer Learning, NLP for Related Languages, NLP for Indian Languages

Machine Learning: Deep Learning, Supervised Classification, Sequence Labelling

Education

PhD.

Computer Science & Engineering, IIT Bombay. 2013-Present. CPI: 8.64 (10)

ADVISOR: Prof. Pushpak Bhattacharyya

THESIS: Aided Learning for Low-Resource Languages

SUMMARY: My PhD work focuses on borrowing features from one or more languages (multilingual learning). This should minimise the impact of data sparsity and lead to improvements in the low-resource language for the task in hand. We apply the above intuition to Named Entity Recognition (NER) task. The results validates the above intuition and show that borrowing features from related languages helps in improving the NER performance in low-resource languages. Additionally, the impact of word-order divergence between languages for the task of Machine Translation has been studied.

Research Internship

INDUSTRY: IBM Bangalore. May 2016 to July 2016.

GUIDE: Prof. Mitesh Khapra

TOPIC: Multilingual Models for Language Identification in Code-Mixed Data

OBJECTIVE: We study the performance of deep learning model for language identification task. We experiment with two training strategies. Training individual models for every language pairs involved. Training a single model (multilingual model) for all language pairs jointly. We observe multilingual models to be beneficial for improving the Named Entity tagging performance. However, this comes at a cost as we observed a drop in identification performance for some of the languages.

M.E

Computer Science & Engineering, IISc Bengaluru. 2011-2013. CPI: 5.9 (8)

ADVISOR: Prof. Shirish K Shevde

THESIS: Learning from Positive and Unlabeled Examples

SUMMARY: In many real life cases, it is easy to collect positive examples. It is difficult to define a negative set, but, instead one can collect large unlabeled data. This unlabeled data contains a mixture of both positive and negative examples. Traditional classifiers cannot be directly used in this setting and requires modification. We explored use of Pairwise Ranking based Logistic Regression model to the problem. The motivation for using logistic regression is to get a confidence score from the system. We hoped that this confidence score can be used for better judgement of the class label. We obtained mixed results by beating the baseline on some datasets and performing closer on some datasets.

B.E

Computer Science. *RNS Institute of Technology, Bengaluru*. 2007-2011. Percentage Marks: 81.08%

Publications:

- **Rudra Murthy**, Anoop Kunchukuttan and Pushpak Bhattacharyya, *Addressing word-order Divergence in Multilingual Neural Machine Translation for extremely Low Resource Languages*, Proceedings of the 2019 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies (**NAACL-HLT**), Minneapolis, USA, 2-7 June, 2019.
- **Rudra Murthy**, Mitesh Khapra and Pushpak Bhattacharyya, *Improving NER Tagging Performance in Low-Resource Languages via Multilingual Learning*, ACM Transactions on Asian and Low-Resource Language Information Processing (**TALLIP**), 2019.
- **Rudra Murthy**, Anoop Kunchukuttan and Pushpak Bhattacharyya, *Judicious Selection of Training Data in Assisting Language for Multilingual Neural NER*, Association for Computational Linguistics (**ACL**), Melbourne, Australia, 15-20 July, 2018.
- Joe Cheri Ross, **Rudra Murthy**, Kaustuv Kanti Ganguli, Pushpak Bhattacharyya, *Identifying Raga Similarity in Hindustani Classical Music through Distributed Representation of Raga Names*, 13th International Symposium on Computer Music Multidisciplinary Research, 2017, (**ISCMMR**) , Matosinhos, Porto, 25-28 September, 2017.
- **Rudra Murthy** and Pushpak Bhattacharyya, *A Deep Learning Solution to Named Entity Recognition*, International Conference on Computational Linguistics and Intelligent Text Processing (**CI-Ling**), Konya, Turkey, 3-9 April, 2016.
- Sudha Bhingardive, Dharendra Singh, **Rudra Murthy**, Pushpak Bhattacharyya, *Using Word Embeddings for Bilingual Unsupervised WSD*, Proceedings of the 12th International Conference on Natural Language Processing (**ICON**), Trivandrum, India, December, 2015.
- Sudha Bhingardive, Dharendra Singh, **Rudra Murthy**, Hanumant Redkar, Pushpak Bhattacharyya, *Unsupervised most frequent sense detection using word embeddings*, Proceedings of the 2015 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies (**NAACL-HLT**), Denver, Colorado, USA, 31 May - 5 June, 2015.

Academic Activities:

Tutorials

- **Introduction to Deep Learning:** Sudha Bhingardive, **Rudra Murthy**, Kevin Patel, Prerana Singhal, and Pushpak Bhattacharyya, 12th International Conference on Natural Language Processing (**ICON**), Trivandrum, India, December, 2015.
- **Applications of Deep Learning to NLP:** **Rudra Murthy**, Kevin Patel, Mohammed Shad Akhtar, and Pushpak Bhattacharyya, 14th International Conference on Natural Language Processing (**ICON**), Kolata, India, December, 2017.

Industry Events Participation

- **Amazon Research Days Bangalore** on 28th September 2018
- **ACM-MSR Academic Research Summit 2018** at IIIT Hyderabad on 24th-25th January 2018

Academic Responsibilities

- **Journal Reviewer:** ACM Transactions on Asian and Low-Resource Language Information Processing (TALLIP), Journal by Sadhana - Academy Proceedings in Engineering Science,
- **Conference Reviewer:** NAACL (2019), LREC (2018), COLING (2016)

Training Sessions

- Conducted a training session on Deep Learning at LGSoft Bangalore in June 2017
- Conducted a training session on NLP and Deep Learning at BNP Paribas Mumbai on 9th January 2015
- Conducted Lab Session on WSD related activities at IASNLP 2014, IIIT Hyderabad from 1st July 2014 to 15th July 2014

Tools Created

Source Code on **Github**: <https://github.com/murthyrudra>

Relevant Course Work

Data Mining, Linear Algebra, Natural Language Processing, Foundation of Machine Learning

Technical Skills

- **Programming Language:** C/C++, Java, Python.
- **Platform:** Linux.
- **Deep Learning Framework:** Torch, PyTorch
- **Tools:** L^AT_EX, Beamer

Personal Details

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I, hereby declare that all the information furnished above is true to the best of my knowledge.

Date: March 19, 2019
Place: IIT Bombay, Mumbai

Rudra Murthy V.